Claims

1. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps of:
– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial non-compressed tissue surface area apart from said platform towards an X-ray source, and the suspected lesion having an inside location within said body portion;
– radiating said body portion with X-rays coming successively from at least two different directions to form at least two planar images and respective image data of said body portion;
– calculating, from said at least two image data and from said at least two directions, said inside location in a predetermined three-dimensional coordinate system having two coordinate values in a plane substantially parallel to said platform;
– estimating a configuration of said tissue surface from said image data;
– selecting an entering point for an invasive instrument within said surface area;
– determining a moving direction for said invasive instrument;
– calculating a distance between said entering point on said estimated surface area and said calculated inside location in said moving direction; and
– displaying or outputting said moving direction and said distance, and tracing or displaying or outputting said two coordinate values, for guiding said invasive instrument.

2. A method in accordance with claim 1, wherein said predetermined three-dimensional coordinate system is an orthogonal coordinate system or a polar coordinate system or a combination of an orthogonal and a polar coordinate system.

3. A method in accordance with claim 1, wherein said moving direction includes at least a tilt angle with an axis line parallel to said platform.

4. A method in accordance with claim 3, further comprising the steps of:
– determining said moving direction to be in a first plane perpendicular to said platform and parallel to one of said two coordinate values; and
– displaying or outputting said tilt angle solely as the moving direction.

5. A method in accordance with claim 3, wherein said moving direction further includes a turn angle with an axis line perpendicular to said platform.

6. A method in accordance with claim 5, further comprising the steps of:
– determining said moving direction to be in a second plane perpendicular to said platform and non-parallel to any of said two coordinate values; and
– displaying or outputting both said tilt angle and said turn angle as the moving direction.

7. A method in accordance with claim 1, further comprising the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform;
– moving said light beam to alignment with said selected entering point; and
– tilting said light beam to alignment with said determined moving direction.

8. A method in accordance with claim 7, further comprising the step of turning said at least one light beam around an axis line perpendicular to said platform to alignment with said determined moving direction.

9. A method in accordance with claim 7, further comprising the steps of:
– providing and directing a flattened light beam above said tissue surface and parallel to said platform, said light beam being movable at least in a direction perpendicular to said platform; and
– moving said light beam at a level above said entering point being equal to a difference between the lengths of said invasive instrument and said calculated distance.

10. A method in accordance with claim 7, wherein an invasive instrument has length indicia or a predetermined length respective to said distance is used.

11. A method in accordance with claim 1, further comprising, prior to said steps of determining moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to light beam position means;
– selecting manually said entering point;
– positioning said invasive instrument having a tip on said tissue surface at said selected entering point;
– tracing said light beam to alignment with said tip; and

– allowing said light beam position means to output two prevailing coordinates of said entering point for said determining of said moving direction and said calculating of said distance.

12. A method in accordance with claim 1, further comprising, prior to said steps of determining moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to position detection means;
– selecting manually said entering point;
– feeding two coordinate values of said entering point being in a plane substantially parallel to said platform for said determining of said moving direction and said calculating of said distance.

13. A method in accordance with claim 1, further comprising the steps of:
– providing an invasive instrument guide device with position detection means;
– attaching the invasive instrument having a tip to said guide device and in connection with said position detection means;
– allowing said position detection means to display two prevailing coordinates, a prevailing direction and a prevailing distance of said invasive instrument; and
– moving said tip of the invasive instrument by manual activation to approach said lesion by comparing said displayed two prevailing coordinates, said prevailing direction and said prevailing distance with said calculated two coordinate values, moving direction and distance, and minimizing a difference therebetween.

14. A method in accordance with claim 1, further comprising the steps of:
– providing an invasive instrument guide device with position motor means;
– attaching the invasive instrument having a tip to said guide device and in connection with said position motor means;
– conducting said outputted two coordinate values, said moving direction and said distance to said position motor means; and
– allowing said position motor means to move said tip of the invasive instrument to approach said lesion.

15. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps:

– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial non-compressed tissue surface area apart from said platform towards an X-ray source, and the suspected lesion having an inside location within said body portion;
– attaching at least one marker on said tissue surface area to have an outside location;
– radiating said body portion with X-rays coming successively from at least two different directions to form at least two planar images and respective image data of said body portion;
– deriving inside location data and outside location data from said at least two image data and from said at least two directions;
– calculating said inside location in a predetermined three-dimensional coordinate system from said inside location data with two coordinate values in a plane substantially parallel to said platform;
– estimating a configuration of said tissue surface from said outside location data;
– selecting an entering point for an invasive instrument within said surface area;
– determining a moving direction for said invasive instrument;
– calculating a distance between said estimated tissue surface and said calculated inside location in said moving direction; and
– displaying or outputting said moving direction and said distance, and tracing or displaying or outputting said two coordinate values, for guiding said invasive instrument.

16. A method in accordance with claim 15, wherein said predetermined three-dimensional coordinate system is an orthogonal coordinate system or a polar coordinate system or a combination of an orthogonal and a polar coordinate system.

17. A method in accordance with claim 15, wherein said moving direction includes at least a tilt angle with an axis line parallel to said platform.

18. A method in accordance with claim 17, further comprising the steps of:
– determining said moving direction to be in a first plane perpendicular to said platform and parallel to one of said two coordinate values; and
– displaying or outputting said tilt angle solely as the moving direction.

19. A method in accordance with claim 19, wherein said moving direction further includes a turn angle with an axis line perpendicular to said platform.

20. A method in accordance with claim 19, further comprising the steps of:
– determining said moving direction to be in a second plane perpendicular to said platform and non-parallel to any of said two coordinate values; and
– displaying or outputting both said tilt angle and said turn angle as the moving direction.

21. A method in accordance with claim 15, further comprising the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform;
– moving said light beam to alignment with said selected entering point; and
– tilting said light beam to alignment with said determined moving direction.

22. A method in accordance with claim 21, further comprising the step of turning said at least one light beam around an axis line perpendicular to said platform to alignment with said determined moving direction.

23. A method in accordance with claim 21, further comprising the steps of:
– providing and directing a flattened light beam above said tissue surface and parallel to said platform, said light beam being movable at least in a direction perpendicular to said platform; and
– moving said light beam at a level above said entering point being equal to a difference between the length of said invasive instrument and said calculated distance.

24. A method in accordance with claim 21, wherein an invasive instrument has length indicia or a predetermined length respective to said distance is used.

25. A method in accordance with claim 15, further comprising, prior to said steps of determing moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to light beam position means;
– selecting manually said entering point;
– positioning said invasive instrument on said tissue surface at said selected entering point;
– tracing said light beam to alignment with said invasive instrument; and

– allowing said light beam position means to output two prevailing coordinates of said invasive instrument for said determining of said moving direction and said calculating of said distance.

26. A method in accordance with claim 15, further comprising, prior to said steps of determining moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to light beam position means;
– selecting manually said entering point;
– feeding two coordinate values of said entering point being in a plane substantially parallel to said platform for said determining of said moving direction and said calculating of said distance.

27. A method in accordance with claim 15, further comprising the steps of:
– providing an invasive instrument guide device with position detection means;
– attaching the invasive instrument having a tip to said guide device and in connection with said position detection means;
– allowing said position detection means to display two prevailing coordinates, a prevailing direction and a prevailing distance of said invasive instrument; and
– moving said tip of the invasive instrument by manual activation to approach said lesion by comparing said displayed two prevailing coordinates, said prevailing direction and said prevailing distance with said calculated two coordinate values, moving direction and distance, and minimizing a difference therebetween.

28. A method in accordance with claim 15, further comprising the steps of:
– providing an invasive instrument guide device with position motor means;
– attaching the invasive instrument having a tip to said guide device and in connection with said position motor means;
– conducting said outputted two coordinate values, said moving direction and said distance to said position motor means; and
– allowing said position motor means to move said tip of the invasive instrument to approach said lesion.

29. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps:

– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial non-compressed tissue surface area apart from said platform towards an X-ray source, and the suspected lesion having an inside location within said body portion;
– attaching at least one marker on said tissue surface to have an outside location;
– radiating said body portion with X-rays coming successively from at least two different directions to form at least two individual images and respective image data of said body portion;
– deriving inside location data and outside location data from said at least two image data and from said at least two directions;
– calculating a direction and a respective distance between said marker and said calculated inside location for entering an invasive instrument; and
– displaying or outputting said direction and said distance for guiding said invasive instrument.

30. A method in accordance with claim 29, wherein said predetermined three-dimensional coordinate system is an orthogonal coordinate system or a polar coordinate system or a combination of an orthogonal and a polar coordinate system.

31. A method in accordance with claim 29, wherein said direction is a moving direction for said invasive instrument including at least a tilt angle with an axis line parallel to said platform.

32. A method in accordance with claim 30, further comprising the steps of:
– attaching said marker on said tissue surface so as to be in a first plane perpendicular to said platform and parallel to one of said two coordinate values;
– determining said moving direction to be in said first plane; and
– displaying or outputting said tilt angle solely as the moving direction.

33. A method in accordance with claim 30, wherein said moving direction further includes a turn angle with an axis line perpendicular to said platform.

34. A method in accordance with claim 30, further comprising the steps of:
– attaching said marker on said tissue surface so as to be in a second plane perpendicular to said platform and non-parallel to any of said two coordinate values;
– determining said moving direction to be in said second plane; and
– displaying or outputting both said tilt angle and said turn angle as the moving direction.

35. A method in accordance with claim 29, further comprising the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform;
– moving said light beam to alignment with said marker; and
– tilting said light beam to alignment with said calculated direction.

36. A method in accordance with claim 35, further comprising the step of turning said at least one light beam around an axis line perpendicular to said platform to alignment with said determined moving direction.

37. A method in accordance with claim 35, further comprising the steps of:
– providing and directing a flattened light beam above said tissue surface and parallel to said platform, said light beam being movable at least in a direction perpendicular to said platform; and
– moving said light beam at a level above said entering point being equal to a difference between the lengths of said invasive instrument and said calculated distance.

38. A method in accordance with claim 35, wherein an invasive instrument has length indicia or a predetermined length respective to said distance is used.

39. A method in accordance with claim 29, further comprising the steps of:
– providing an invasive instrument guide device with position detection means;
– attaching the invasive instrument having a tip to said guide device and in connection with said position detection means;
– allowing said position detection means to display a prevailing direction and a prevailing distance of said invasive instrument;
– moving said tip of the invasive instrument by manual activation from the side of the marker to approach said lesion by comparing said prevailing direction and said prevailing distance with said calculated direction and distance, and minimizing a difference therebetween.

40. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps:
– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial non-compressed

tissue surface area apart from said platform towards an X-ray source, and the suspected lesion having an inside location within said body portion;
– radiating said body portion with X-rays coming from at least a first direction to form at least a first individual image and respective image data of said body portion;
– deriving inside location data from said at least first images and from said at least first direction;
– calculating said inside location in a predetermined two-dimensional coordinate system from said inside location data with coordinate values in a plane substantially parallel to said platform;
– displaying or outputting said two coordinates for guiding said invasive instrument;
– determining a moving direction for an invasive instrument having a tip;
– radiating said body portion, after inserting an invasive instrument into said body portion or in contact or approaching a contact with said tissue surface, with X-rays coming from at least a second direction to form at least a second individual image of said body portion;
– measuring a spacing between said tip and said suspected lesion from said second image;
– calculating, from said spacing and from said second direction, a distance between said tip and said suspected lesion in said moving direction; and
– displaying or outputting said distance and said moving direction for guiding said invasive instrument.

41. A method in accordance with claim 40, wherein said moving direction includes at least a tilt angle with an axis line parallel to said platform.

42. A method in accordance with claim 41, further comprising the steps of:
– determining said moving direction to be in a first plane perpendicular to said platform and parallel to one of said two coordinate values; and
– displaying or outputting said tilt angle solely as the moving direction.

43. A method in accordance with claim 41, wherein said moving direction further includes a turn angle with an axis line perpendicular to said platform.

44. A method in accordance with claim 43, further comprising the steps of:
– determining said moving direction to be in a second plane perpendicular to said platform and non-parallel to any of said two coordinate values; and

– displaying or outputting both said tilt angle and said turn angle as the moving direction.

45. A method in accordance with claim 40, further comprising the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform;
– tracing said light beam to alignment with said tip in contact with said tissue surface, or to alignment with a point where said invasive instrument crosses said tissue surface; and
– tilting said light beam to alignment with said determined moving direction.

46. A method in accordance with claim 45, further comprising the step of turning said at least one light beam around an axis line perpendicular to said platform to alignment with said determined moving direction.

47. A method in accordance with claim 45, further comprising the steps of:
– providing and directing a flattened light beam above said tissue surface and parallel to said platform, said light beam being movable at least in a direction perpendicular to said platform; and
– moving said light beam at a level above said entering point being equal to a difference between the lengths of said invasive instrument and said calculated distance.

48. A method in accordance with claim 45, wherein an invasive instrument has length indicia or a predetermined length respective to said distance is used.

49. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps:
– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial tissue surface area apart from said platform and compressed by a compression plate substantially transparent to X-rays and having a plurality of perforations towards an X-ray source, and the suspected lesion having an inside location within said body portion;
– radiating said body portion with X-rays coming successively from at least two different directions to form at least two individual images and respective image data of said body portion and of said perforated plate;

– deriving inside location data and perforated plate location data from said at least two image data and from said at least two directions;
– selecting at least one perforation in said plate and determining a moving direction for an invasive instrument through said at least one perforation;
– calculating a distance between said at least one perforation of said plate and said calculated inside location in said moving direction of the invasive instrument; and
– displaying or outputting said at least one perforation, said direction and said distance for guiding said invasive instrument.

50. A method in accordance with claim 49, wherein said moving direction includes at least a tilt angle with an axis line parallel to said platform.

51. A method in accordance with claim 50, further comprising the steps of:
– determining said moving direction to be in a first plane perpendicular to said platform and parallel to one of said two coordinate values; and
– displaying or outputting said tilt angle solely as the moving direction.

52. A method in accordance with claim 50, wherein said moving direction further includes a turn angle with an axis line perpendicular to said platform.

53. A method in accordance with claim 52, further comprising the steps of:
– determining said moving direction to be in a second plane perpendicular to said platform and non-parallel to any of said two coordinate values; and
– displaying or outputting both said tilt angle and said turn angle as the moving direction.

54. A method in accordance with claim 49, further comprising the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform;
– moving said light beam to alignment with said selected perforation; and
– tilting said light beam to alignment with said determined moving direction.

55. A method in accordance with claim 54, further comprising the step of turning said at least one light beam around an axis line perpendicular to said platform to alignment with said determined moving direction.

56. A method in accordance with claim 49, further comprising, prior to said steps of determining moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to light beam position means;
– selecting manually said perforation;
– positioning said invasive instrument on said tissue surface at said selected perforation;
– tracing said light beam to alignment with said invasive instrument; and
– allowing said light beam position means to output two prevailing coordinates of said selected perforation for said determining of said moving direction and said calculating of said distance.

57. A method in accordance with claim 49, further comprising, prior to said steps of determing moving direction and calculating distance, the steps of:
– providing and directing at least one light beam into said tissue surface and within said surface area, said light beam being movable at least parallel to said platform and tiltable around an axis line parallel to said platform and connected to light beam position means;
– selecting manually said perforation;
– feeding two coordinate values of said selected perforation being in a plane substantially parallel to said platform for said determining of said moving direction and said calculating of said distance.

58. A method in accordance with claim 54, further comprising the steps of:
– providing and directing a flattened light beam above said tissue surface and parallel to said platform, said light beam being movable at least in a direction perpendicular to said platform; and
– moving said light beam at a level above said perforation being equal to a difference between the lengths of said invasive instrument and said calculated distance.

59. A method in accordance with claim 54, wherein an invasive instrument has length indicia or a predetermined length respective to said distance is used.

60. A method for pointing a suspected lesion in an X-rayed body portion of a human or animalian body, the method comprising the steps:

– clamping said body portion in a fixed position on a platform provided with a radiographic imaging detector, said body portion having a substantial tissue surface area apart from said platform and compressed by a compression plate substantially transparent to X-rays and having a plurality of perforations towards an X-ray source, and the suspected lesion having an inside location within said body portion;

– radiating said body portion with X-rays coming from at least a first direction to form at least an individual image and respective image data of said body portion and of said perforated plate;

– selecting a perforation in said plate and determining a moving direction for an invasive instrument having a tip through said at least one perforation;

– radiating said body portion, after inserting said invasive instrument, with X-rays coming from at least a second direction to form at least another individual image and respective image data of said body portion and of said perforated plate and said invasive instrument;

– calculating a distance between said tip of the invasive instrument and said calculated inside location in said moving direction of the invasive instrument; and

– displaying or outputting said distance for further guiding said invasive instrument.